

subject. My contention seems so plausible that I venture to appeal to you to allow me to give the following brief exposition of my view, in the hope that I may be able to elicit some authoritative reply.

The amount of solar radiation is at present, for all intents and purposes, expressed in terms of melting ice. In other words, the sun is supposed to be giving forth as much heat as he would do were he surrounded, close to the photosphere, by a constantly renewed shell of ice, or never-failing ocean of water. My conception is, that, judging from what we know of hot bodies cooling upon the earth, it is impossible to believe that the sun could be pouring forth so much heat under existing conditions, as he would do were he continually to radiate to ice or water close to all parts of his surface.

The velocity, and the rapidity of vibration of the waves of light and heat can be accurately measured. This is the sum of motion—known as radiant heat—which the sun imparts to his surrounding medium. Absorbed heat is a very different thing (Balfour Stewart), and could not exist without the particles of matter. Now I fail to perceive what grounds the authorities have for calculating, as they do, that the sun's radiation amounts to something over a million calories per minute for each square metre of his surface. This means a million times the quantity of heat which will raise the temperature of a kilogramme of water 1° C. No doubt if the sun were surrounded by water the above would represent a correct estimate of the outflow of heat. But the men of science ignore, it appears to me, the marvellous virtue of the "if" in this case. The communication of heat consists in forcing the molecules and atoms of matter asunder against the attractions of cohesion and affinity, and causing the particles to vibrate; and there is no proof, but the evidence is all the other way, that the sum of motion imparted by the sun to the ether of space would represent anything like the expenditure of energy as would do the raising of water to an enormous temperature. If a red-hot globe of iron or copper were caused close to the surface to radiate to ice, the metal would cool much more quickly than if it were merely exposed to a very dry atmosphere—that is to say, the metal's radiant heat would constitute a less expenditure of energy than its emission of absorbed heat. I do not see, therefore, why we should not conclude that exactly the same result, only of course on a very vast time-scale, would happen in the case of the sun.

The enormously long periods demanded for the sun's past life-time by the geologist and biologist furnish strong antecedent support in favour of my contention. W. GOFF.

New University Club, S.W., August 15.

Morley Memorial College.

YOUR readers may be interested in hearing of a successful attempt to add another round to the ladder, described by Prof. Huxley, extending "from the gutter to the University." Some supporters of the Morley Memorial College for Working Men and Women, in the Waterloo Road, last year read an account in your pages of the arrangements made by the University Extension Society for some of its students to spend a month at Cambridge during the vacation. They resolved to offer scholarships to those who took the best places in the Christmas and Easter examinations in connection with Mr. McClure's astronomy class, whereby they might avail themselves of these arrangements. This, thanks to Dr. Roberts's kind co-operation, was successfully accomplished. Three students went to Cambridge, the most successful in a class all of whom did well. A plumber and a printer's reader went to Selwyn College, an elementary schoolmistress to Newnham. Two were able to take advantage of the whole month; the third (being a family man) could only spare a fortnight from his work, but all speak warmly of the pleasure and profit they have derived. The following are some extracts from their letters.

One says:—"I took chemistry and geology on alternate days, besides attending the majority of the single lectures. The work being mostly of a practical kind, has been intensely interesting." Another, after an enthusiastic description of the place, the architecture, and the College gardens, goes on:—"Everybody was most kind, cordial, and sociable, without the slightest suspicion of stiffness or formality, of condescension or patronage. More than this, everybody we met seemed to be studying our interests especially, and doing all in their power to make our stay as enjoyable as possible. . . . In science, geology was

the only subject I was permitted to take up. In literature and art I attended courses on Browning and Tennyson, and on Greek art, Greek history, and Herodotus, also single lectures on 'Leopold Ranke,' . . . and 'College Life Past and Present.' I hope to continue these studies as far as possible in my home reading. . . . Beyond the actual instruction received in the lectures, there has been given an impetus to further study, from which a continuous benefit must be reaped, and I have obtained a clear idea of what a student's life in a University town is like."

Cambridge opens its doors in this way only to members of University Extension classes, but at Oxford anyone may attend the classes who pays the fee. The authorities of our College accordingly offered scholarships to those of their students who passed highest in the Science and Art examinations for electricity, chemistry, and mechanical drawing. The results of these were not known early enough for the first half of the vacation classes, but the second fortnight in August was so much enjoyed that those who made the arrangements considered themselves well repaid for their trouble, though this was not small, for working men do not find it easy to get leave of absence for even a fortnight at a certain specified time. "One of the most enjoyable holidays I ever spent," writes one; "I have quite a collection of geological specimens collected on the excursion."

No wonder they enjoyed it! They come from surroundings generally dreary, sometimes squalid. They have scrambled for their education, and gained it under difficulties. They find themselves in a picturesque town, full of interesting associations, and meet with kindness without patronage from cultured men and women. Will not the school teacher's work have an added interest and dignity now she has seen (if only by a passing glimpse) what education is in its higher branches? Will not all of them feel that life contains something besides manual drudgery for weekly wages, and that those whose lot is exempt from drudgery of this kind are willing and anxious to share with them the results of culture and leisure? We live in times of a difficult transition from the old feudal loyalty to self-respecting friendship between free men, who can be mutually helpful to each other just because their circumstances and advantages are different. Feudalism was good in its day, but it has outlasted the conditions which made it so, and the "ladder from the gutter to the University" is an important instrument in effecting the transition safely to something better.

May I add that, unless the College and the scholarships receive wider support from the public than they have done, it will be difficult if not impossible to carry them on efficiently? Our fees are necessarily so low that the institution can never be self-supporting. We charge 1s. entrance fee, and 1s. 6d. a term for the first class; 6d. for each additional class. Larger fees would exclude some of our best students (one who had a perfect passion for knowledge was a rag-sorter till a better situation was found for him by one of our Council). The public imagine that we have already received a sufficient endowment from the City Parochial Charities fund. We hope shortly to have a grant from that fund, but we have lived on this hope for the last two years, and find it a sadly insufficient resource to provide intellectual food for 800 students. At this beginning of a fresh session we should gratefully welcome either personal help, or a subscription to general expenses or to the Scholarship Fund. A month at Cambridge costs about £7, and I have no doubt that (if the money were forthcoming) we should be able to arrange for scholarships to Cambridge from the University Extension Class on Physiography which Mr. A. W. Clayden is about to conduct. A fortnight at Oxford costs £5, and we hope this winter to have ten classes in connection with the Science and Art Department, to which we should like to offer this advantage.

September 9.

EMMA CONS (Hon. Sec.).

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE: WASHINGTON MEETING.

THE month of August 1891 was distinguished by the most notable array at Washington of scientific meetings ever held in America. The series began with the meeting of the American Society of Microscopists on August 11, and afterwards, consecutively or simultaneously, came those of the Association of American Agricultural Colleges and Experiment Stations; the Association of